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BULLETIN No. 292

SOYBEAN HAY AND SWEET-CLOVER PASTURE FOR GROWING PUREBRED DRAFT FILLIES

By J. L. Edmonds and C. W. Crawford

Illini Lou 185332, one of the fillies in the experiment. This filly weighed 1,580 pounds the spring she was two years old, just a few days before the picture was taken.

URBANA, ILLINOIS, JUNE, 1927

SUMMARY

The results of this experiment indicate that soybean hay when properly supplemented is a satisfactory roughage for growing draft fillies. In fact, a comparison with previous experiments indicates that it is equal to alfalfa for this purpose. By combining sweet-clover pasture with blue-grass, the fillies had the advantage of a longer pasture season. The sheaf oats, which were fed continuously, served as a balance at all times. They prevented too great a consumption of bean hay in winter and furnished the dry roughage which the fillies seemed to crave while on sweet-clover pasture. The gains made on pasture during the summer were slightly higher than those made the first winter and considerably higher than during the second winter.

As weanlings the fillies ate approximately 8 pounds each of sheaf oats and soybean hay and 2.3 pounds of grain a head daily. The second winter their daily consumption was over 9 pounds each of sheaf oats and soybean hay and 3.41 pounds of grain. These amounts produced good gains in height and frame and kept the fillies in thrifty condition. At no time was there a filly off feed.

While it is difficult to say just what effect was produced by the small amount of bone meal which was fed daily, it seemed to be beneficial. The feet on these fillies were exceptional in size and toughness.

At the end of the experiment the fillies, in medium condition and four of them not yet two years old, averaged 1,484 pounds and stood 15 hands 3.4 inches in height.

Good results in growing young draft fillies may be obtained by moderate, regular feeding of sheaf oats and a legume hay supplemented with a very light feed of crushed oats, bran, and bone meal, judging from the results of this test. Furthermore the value of using sweet-clover pasture along with permanent blue-grass pasture seems to be demonstrated.

At present prices for the feeds used, growth was cheaply made.

SOYBEAN HAY AND SWEET-CLOVER PASTURE FOR GROWING PUREBRED DRAFT FILLIES

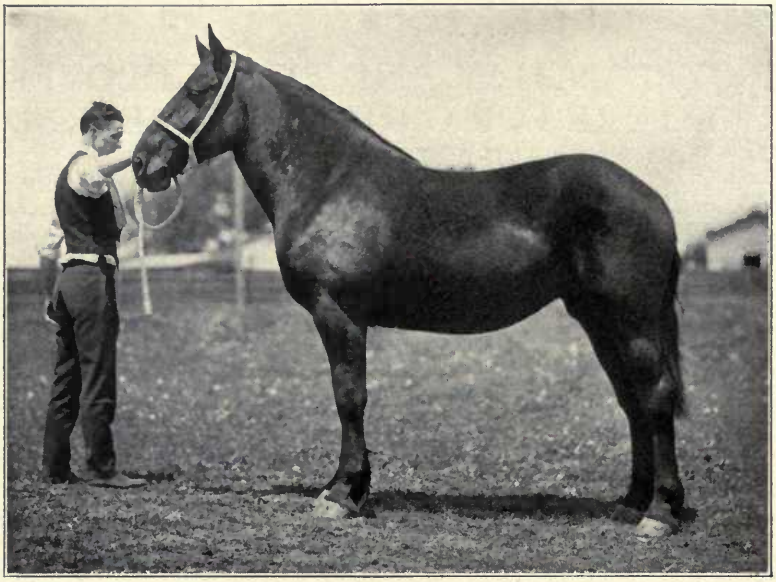
By J. L. Edmonds, Chief in Horse Husbandry, and C. W. Crawford, Associate in Animal Husbandry

Farm practices in Illinois have changed considerably in the last decade. Among these changes has been a large increase in the acreage of soybeans and sweet clover. In 1924, the year this experiment started, there were 747,000 acres of soybeans and 240,000 acres sown to sweet clover in this state. These crops yield a large amount of roughage which as yet meets with little demand on the market and which must be fed on the farm where it is grown if its greatest value is to be realized.

With this increasing amount of roughage to be consumed on the farm and plenty of cheap grain, good horses will continue to be an efficient and cheap source of farm power. If desirable draft horses are to be produced economically, they must be well grown on these farm feeds fed in suitable amounts and properly supplemented. This experiment is the fifth of a series planned to test out different home-grown feeds, the production of which fits in with the best methods of farming in Illinois. To date seven lots, including 62 fillies, have been fed. The results of all these tests are summarized in Table 7 on the last page of this bulletin.

In the previous experiments alfalfa hay was used for the roughage. In the present experiment soybean hay was substituted for alfalfa and sweet-clover pasture was used to supplement blue-grass. In order to make a well-balanced and safe ration, sheaf oats were used in combination with these legumes. Altho this feed is produced on nearly all Illinois farms and at one time was used in some sections as a horse feed, it rarely is fed at present in the unthreshed state. A wide use of sheaf oats would have cut feed bills generally in 1926. Rainy weather prevented threshing, the oat shocks were badly damaged by rain, and when finally threshed yielded a very poor quality of straw and oats. Consequently many farmers bought oat straw at $15 a ton or more from a few of their neighbors who were lucky enough to have threshed before the rains. The few who had stored sheaf oats had good, sound feed instead of the poor quality which was generally used.

Some thought has always been given to feeding horses a properly balanced grain ration. Not so much can be said, however, of the attention paid to making the legume hay rations for farm horses more effective, safer, and cheaper by feeding sheaf oats or oat straw along



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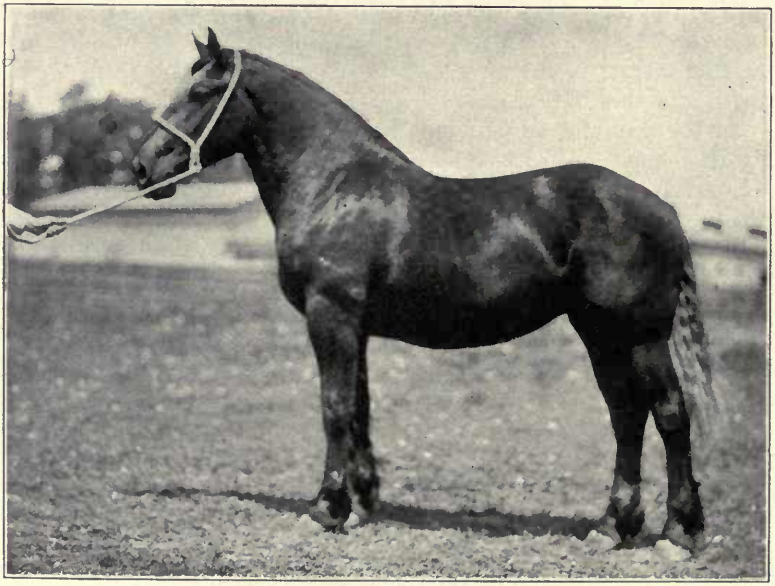

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with the legume hay. Such use adds to the value of the oats crop and makes the nutritious legume hay go further.

Ten Percheron weanling fillies were used in this trial. Five of them were bred at the University and five were purchased from Illinois breeders. The experiment started December 15, 1924, and ended May 3, 1926, extending over a total of 504 days.

WINTER RATION PRINCIPALLY SHEAF OATS AND SOYBEAN HAY

The winter ration consisted of equal parts of sheaf oats[1] and soybean[2] hay and in addition a very light feed of grain was offered once daily. This consisted of 80 percent crushed oats and 20 percent wheat bran. A small amount of deodorized steamed bone meal was mixed with the grain. The fillies were started on 2 pounds of grain and 2 ounces of bone meal a head daily. This was gradually increased until the end of the experiment, when they were eating daily 3.6 pounds of grain and 2.4 ounces of bone meal. The daily consumption of grain in addition to that in the sheaf oats was held down to approximately ¼ pound per hundredweight thruout the test. The good gains secured on pasture were doubtless due in part to the small amount of grain fed during the previous winter. Somewhat less than a pound of each of the roughages was eaten per hundredweight daily. Both the grain and the roughage were fed in mangers built along the sides of roomy box stalls.

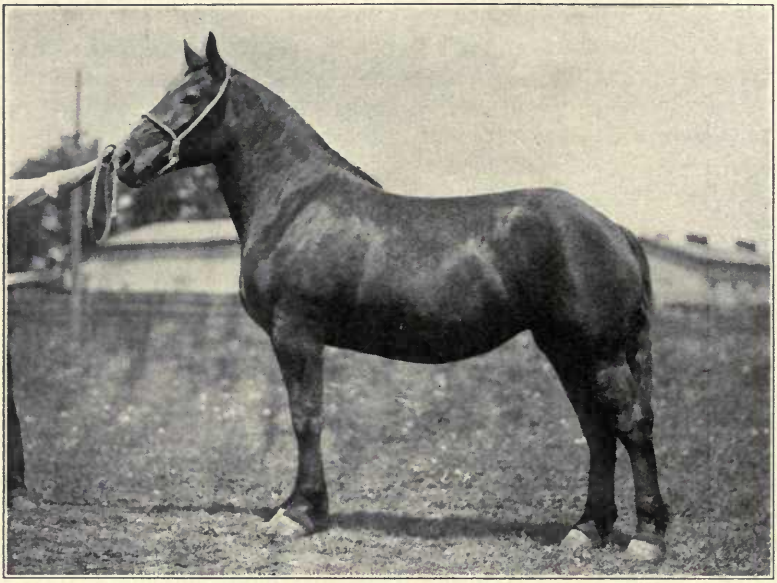
A cover made of rough oak slats and patterned after an ordinary ladder was placed on top of the roughage in the mangers. The "ladder" settled with the hay or sheaf oats and kept them spread out evenly. This gave each filly an equal chance at the feed and made it impossible for any portion to be thrown out of the manger and wasted. Legs of ½-inch pipe about 4 inches long, bolted to the underside of the "ladder," kept it off the bottom of the manger so that the fillies had no trouble in cleaning up everything. The feeding was done in such a way that the manger was usually empty by the next feeding time. Salt and water were before the fillies at all times. Wheat straw was used for bedding.

SWEET CLOVER USED FOR SUMMER PASTURE

In summer from June 28 to August 24, the fillies ran on four acres of sweet-clover pasture and were fed sheaf oats once daily. Fillies running on succulent sweet clover seem to crave some dry carbonaceous

[1]Early oats which ran about half straw and half grain were used.

[2]The varieties sown were Manchu and Ebony, half and half. However, in the cured hay there were very few Ebony beans.



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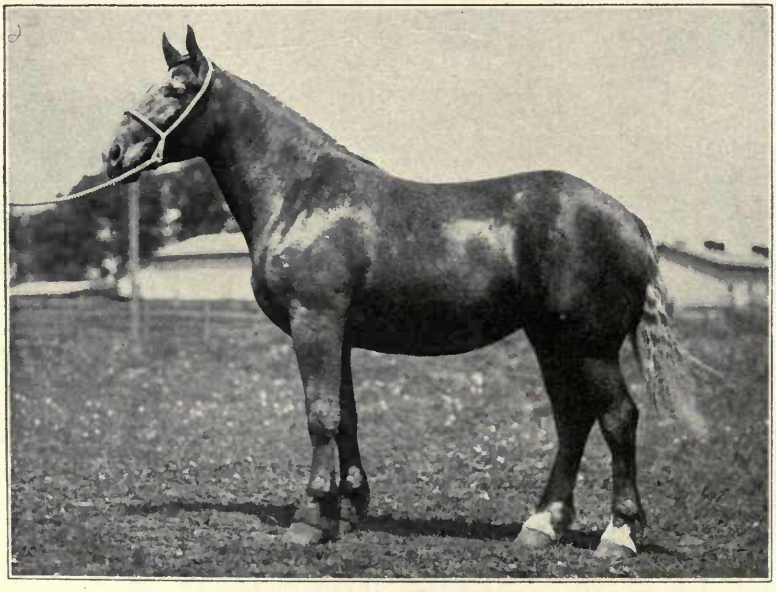

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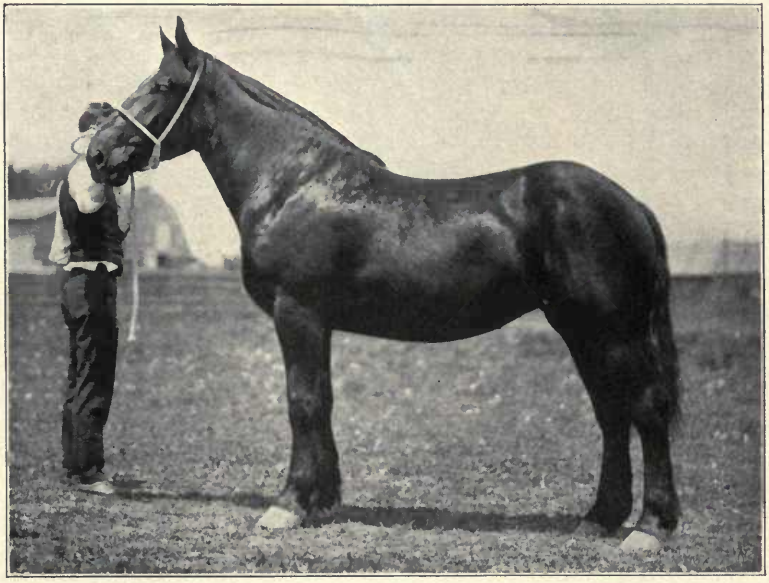

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TABLE 1.—FEED CONSUMED BY FILLIES: NOT INCLUDING PASTURE

Period: 28 days	Average daily ration per head				Average daily feed per cwt. of animal			
	Grain[1]	Sheaf oats	Soybean hay	Bone meal	Grain[1]	Sheaf oats	Soybean hay	Bone meal
	lbs.	*lbs.*	*lbs.*	*lbs.*	*lbs.*	*lbs.*	*lbs.*	*lbs.*
Dec. 15, 1924–Jan. 11, 1925	2.08	6.61	6.66	.12	.24	.77	.78	.01
Jan. 12–Feb. 8	2.25	7.37	7.40	.12	.25	.82	.83	.01
Feb. 9–Mar. 8	2.30	8.28	8.60	.13	.25	.90	.93	.01
Mar. 9–Apr. 5	2.41	8.77	9.17	.17	.25	.91	.95	.02
Apr. 6–May 3	2.50	9.24	9.63	.15	.25	.92	.96	.01
May 4–May 31	2.61	8.04	....	.15	.25	.76	...	.01
June 1–June 28	2.77	10.79	....	.15	.25	.96	...	.01
June 29–July 26	2.87	12.09	....	.15	.25	1.05	...	.01
July 27–Aug. 23	3.02	15.00	....	.15	.25	1.24	...	.01
Aug. 24–Sept. 20	3.11	13.13	....	.15	.25	1.06	...	.01
Sept. 21–Oct. 18	3.12	11.00	1.25	.15	.25	.87	.10	.01
Oct. 19–Nov. 15	3.27	7.62	7.60	.15	.25	.58	.58	.01
Nov. 16–Dec. 13	3.30	8.96	8.72	.15	.24	.66	.65	.01
Dec. 14–Jan. 10, 1926	3.35	9.46	9.47	.15	.24	.69	.69	.01
Jan. 11–Feb. 7	3.41	9.85	9.68	.15	.25	.72	.70	.01
Feb. 8–Mar. 7	3.46	10.29	9.95	.15	.25	.74	.71	.01
Mar. 8–Apr. 4	3.52	10.49	10.18	.15	.25	.73	.71	.01
Apr. 5–May 2	3.60	10.49	10.35	.15	.25	.72	.71	.01
Entire experiment: Dec. 15, 1924–May 2, 1926, 504 days	2.94	9.86	6.04	.15	.25	.83	.51	.01

[1]Grain: crushed oats, 80 percent; bran, 20 percent.

roughage and it was found that the straw in sheaf oats "filled the bill." The light feed of grain was continued also in order to insure the consumption of the bone meal. The sweet-clover pasture was a fresh seeding and on account of a very backward spring was quite slow in getting started.

From May 4 to June 23 the fillies were on blue-grass pasture. From June 23 to June 28 they were on blue-grass and sweet clover which contained a sprinkling of alfalfa plants. They were returned to the blue-grass on August 24, and ran there until December 21. The blue-grass pasture consisted of eight acres.

AMOUNTS OF FEED CONSUMED

During the first winter the weanling fillies ate an average of 8.05 pounds of sheaf oats, 8.29 pounds of soybean hay, and 2.3 pounds of grain a head daily. While on pasture they consumed an average of 2.91 pounds of grain and 11.97 pounds of sheaf oats daily. The second winter their daily average was 9.44 pounds of sheaf oats, 9.27 pounds of soybean hay, and 3.41 pounds of grain.

The detailed data concerning the feeds consumed aside from pasture are given in Table 1. The total amounts eaten by the ten fillies were as follows:

	First winter 140 days	*Summer 161 days*	*Second winter 203 days*	*Total 504 days*
Oats	80.7 bu.	117.0 bu.	173.0 bu.	370.7 bu.
Bran	645.5 lbs.	935.6 lbs.	1384.2 lbs.	2965.3 lbs.
Sheaf oats	5.64 tons	9.63 tons	9.58 tons	24.85 tons
Soybean hay	5.81 tons	.....	9.40 tons	15.21 tons
Bone meal	197.5 lbs.	241.5 lbs.	304.5 lbs.	743.5 lbs.

All roughage not eaten was weighed back and the amount deducted from the amount fed. The refuse contained a considerable proportion of stems of coarse weeds. More was refused the first winter than the second, showing that weanlings should not be asked to consume too much coarse roughage. It is probable that more grain and less roughage the first winter would have been somewhat more satisfactory.

During the first winter the fillies left 3.5 percent of the sheaf oats and 3.7 percent of the soybean hay. During the summer they left 2 percent of the sheaf oats. During the second winter they refused .4 percent of the sheaf oats and 2.6 percent of the bean hay.

For the entire period the amounts weighed back represented 1.7 percent of the sheaf oats and 3 percent of the soybean hay. The closeness with which the fillies ate the coarser parts of their soybean hay was surprising. The coarse stems were more palatable than one would have supposed from examining them.

TABLE 2.—AGES, HEIGHTS, AND WEIGHTS OF FILLIES AT BEGINNING AND END OF TEST

Name	Age Dec. 15, 1924	Height Dec. 15, 1924	Height May 3, 1926	Weight Dec. 15, 1924	Gain Dec. 14, 1925	Gain May 3, 1926	Final weight
	days	*hands in.*	*hands in.*	*lbs.*	*lbs.*	*lbs.*	*lbs.*
1. Marie	217	13 3½	15 3¼	825	560	645	1470
2. Sybil	267	14 1	16 ¼	850	530	660	1510
3. Fashion	232	14 0	15 3	785	610	725	1510
4. Illini Alice	280	14 1½	16 0	910	465	640	1550
5. Illini Cleo	233	14 ½	16 0	890	585	700	1590
6. Irene	265	14 2	16 ¾	990	450	545	1535
7. Illini Lou	251	14 0	15 3¼	875	575	705	1580
8. Fanny	220	14 ¾	15 3½	845	515	630	1475
9. Illini Averne	198	13 2½	15 2½	705	525	635	1340
10. Illini Alma	191	13 ¾	15 1½	610	555	670	1280
Average of 10 head	235.4	14 1/20	15 3/5	828.5	537	655.5	1484

Illini Alice, Illini Cleo, Illini Lou, Illini Averne, and Illini Alma were bred by the University; Marie and Irene by E. L. Krepps, Farmer City; Sybil by J. H. Serven & Son, Prairie City; Fashion by Wm. Freitag, Minier; and Fanny, by Wm. J. Vint & Son, Kinsman.

TABLE 3.—AVERAGE WEIGHTS, HEIGHTS, AND GAINS OF THE FILLIES BY TWENTY-EIGHT DAY PERIODS

Period: 28 days	Average weight[1] during period	Average daily gain in weight	Average gain in height during period
	lbs.	*lbs.*	*inches*
Dec. 15, 1924–Initial weight and height	(828.5)	.....	(56.05)
Dec. 15, 1924–Jan. 11, 1925	853	2.18	.78
Jan. 12–Feb. 8	895	.68	.65
Feb. 9–Mar. 8	922	1.50	.78
Mar. 9–Apr. 5	965	1.43	.45
Apr. 6–May 3	1 007	1.50	....
May 4–May 31	1 056	3.02	1.15
June 1–June 28	1 126	.30	.55
June 29–July 26	1 150	2.43	−.85
July 27–Aug. 23	1 208	.64	1.18
Aug. 24–Sept. 20	1 237	1.36	.80
Sept. 21–Oct. 18	1 264	1.70	.35
Oct. 19–Nov. 15	1 320	1.52	.55
Nov. 16–Dec. 13	1 347	.93	−1.15
Dec. 14–Jan. 10, 1926	1 370	.41	1.38
Jan. 11–Feb. 7	1 377	.27	.05
Feb. 8–Mar. 7	1 398	1.25	.08
Mar. 8–Apr. 4	1 429	1.02	.52
Apr. 5–May 2	1 461	1.29	.10
May 3, 1926–Final weight and height	1 484	....	63.40
Average weight for total time: Dec. 15, 1924–May 2, 1926, 504 days.	1 188	1.30	7.35

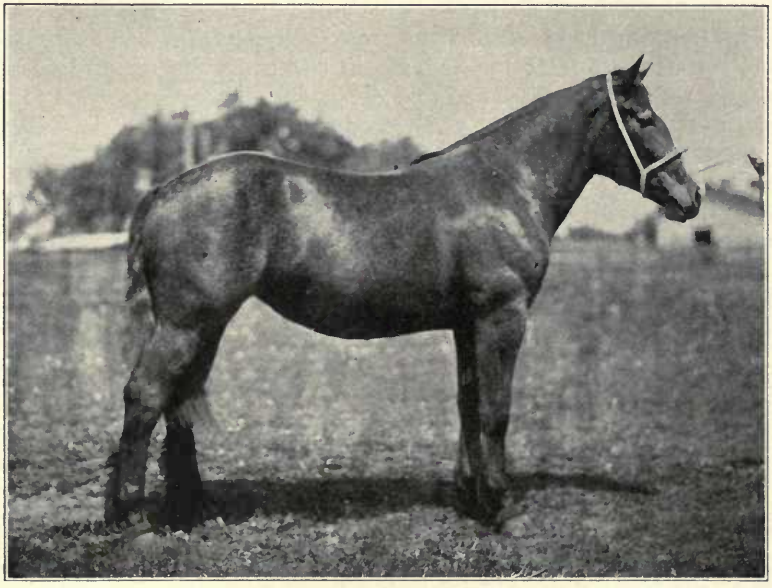
[1]Calculated from weekly weights. [2]This recorded loss of over an inch, coupled with the gain shown for the next 28 days, is probably due to the trimming of the feet of the fillies and to differences in the taking of the measurements.

FILLIES MADE GOOD DEVELOPMENT

The development made by these fillies was very satisfactory. The purpose in feeding was not to make maximum gains but to grow the fillies out well, keeping them sound in their joints if possible and in thrifty growing condition. They made a good growth and have continued to develop well since the close of the experiment. Several of them should mature into ton mares. A good idea of the kind of growth made can be obtained from the accompanying pictures, which were taken soon after the experiment ended. The weights and heights taken at various intervals are given in Tables 2 and 3.

The fillies did especially well on pasture. By combining sweet clover and blue-grass, the length of the pasture season was considerably increased. The amount of development which fillies make on pasture depends to some extent on the way they are fed the previous winter. If they are kept growing on moderate rations, their development will be much greater the following summer, than if they are wintered in high condition. On account of the amount of exercise taken on pasture, by no means all of this development is evident on weigh days, but this exercise is as necessary for maintaining soundness as feed is for growth.

The feeding of bone meal appeared to be beneficial. With one exception, the fillies grew plenty of bone and their feet were large and



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tough. There was no difficulty in getting them to eat the deodorized feeding bone meal when it was mixed with crushed oats and bran.

TABLE 4.—WEIGHTS AND HEIGHTS OF THE FILLIES AT ONE AND TWO YEARS OF AGE

Name	Weight at 1 year	Weight at 2 years	Gain in weight during 2d year	Height at 1 year	Height at 2 years	Gain in height during 2d year
	lbs.	*lbs.*	*lbs.*	*hands in.*	*hands in.*	*in.*
1. Marie	1 070	1 490	420	14 3¼	15 3½	4¼
2. Sybil	985	1 440	455	14 3¾	16 ½	4¾
3. Fashion	975	1 490	515	14 2½	16 ¼	5¾
4. Illini Alice	1 025	1 465	440	14 3¾	15 3½	3¾
5. Illini Cleo	1 130	1 610	480	14 3½	16 0	4½
6. Irene	1 110	1 480	370	15 ½	16 1	4½
7. Illini Lou	1 030	1 540	510	14 3¼	15 2¾	3½
8. Fanny	980	1 480	500	14 3¾	16 ¼	4½
9. Illini Averne	1 010	1 400	390	14 2¾	16 1	6¼
10. Illini Alma	935	1 310	375	14 ¾	15 2½	5¾
Average	1 025	1 470	445	14 3.18	15 3.93	4¾

SUGGESTIONS FOR STORING SHEAF OATS.—In storing sheaf oats in the mow of the horse barn some precautions should be taken to keep out rats and mice, which not only may eat the grain but also render unpalatable a considerable amount in addition. Scattering hydrated lime over the successive layers of sheaves as they were put in the mow, during several years experience at the University, has almost eliminated the damage from this source. One year the hydrated lime was weighed and it was found that 250 pounds had been scattered thru 34 tons of sheaf oats. In feeding, much of the lime is shaken off and the palatability of the feed does not seem to be injured in the least.

Hay or straw should not be piled against the sides of the pile or stack of stored sheaf oats.

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TABLE 5.—FEED CONSUMED AND GAINS BY SEASONS: NOT INCLUDING PASTURE

	Feed consumed				Gains	
	Grain[1]	Sheaf oats	Soybean hay	Bone meal		
First Winter: December 15, 1924, to May 3, 1925: 140 days						
	lbs.	*lbs.*	*lbs.*	*lbs.*		
Feed per horse	322.7	1127.7	1160.6	19.8	Aver. gain in weight, *lbs.*	204.0
Aver. daily ration	2.30	8.05	8.29	.14	Aver. daily gain in weight, *lbs.*	1.46
Aver. daily ration per cwt.	.25	.87	.89	.01	Aver. gain in height, *inches*	2.65
Aver. feed per pound gain	1.58	5.53	5.69	.10		
Summer: May 4, 1925, to October 11, 1925: 161 days						
Feed per horse	467.8	1926.4	.....	24.2	Aver. gain in weight, *lbs.*	256.0
Aver. daily ration	2.91	11.97	.....	.15	Aver. daily gain in weight, *lbs.*	1.59
Aver. daily ration per cwt.	.25	1.02	.....	.01	Aver. gain in height, *inches*	3.18
Aver. feed per pound gain	1.83	7.52	.....	.09		
Second Winter: October 12 to May 2, 1926: 203 days						
Feed per horse	692.1	1915.7	1881.7	30.4	Aver. gain in weight, *lbs.*	195.5
Aver. daily ration	3.41	9.44	9.27	.15	Aver. daily gain in weight, *lbs.*	.96
Aver. daily ration per cwt.	.25	.68	.67	.01	Aver. gain in height, *inches*	1.52
Aver. feed per pound gain	3.54	9.80	9.62	.16		
Entire Period: 504 days						
Feed per horse	1483	4970	3042	74.4	Aver. gain in weight, *lbs.*	655.5
Aver. daily ration	2.94	9.86	6.04	.15	Aver. daily gain in weight, *lbs.*	1.30
Aver. daily ration per cwt.	.25	.83	.51	.01	Aver. gain in height, *inches*	7.35
Aver. feed per pound gain	2.26	7.58	4.64	.11		

[1]Grain: crushed oats, 80 percent; bran, 20 percent.

TABLE 6.—COSTS OF FEEDS PER HEAD ASSUMING VARIOUS PRICES

Scale of prices	A	B	C	D	E
Oats per bushel	$ .40	$ .40	$ .35	$ .32	$ .60
Bran per ton	26.00	26.00	26.00	24.00	40.00
Soybean hay per ton	10.00	14.00	11.00	12.00	18.00
Sheaf oats per ton	10.00	14.00	10.00	12.00	18.00
Deodorized bone meal per cwt.	1.50	1.50	1.50	1.50	1.50
Pasture per acre	10.00	10.00	10.00	10.00	12.00
First Winter: December 15, 1924, to May 3, 1925: 140 days					
Crushed oats and bran	$ 4.07	$ 4.07	$ 3.66	$ 3.35	$ 6.13
Soybean hay and sheaf oats	11.45	16.03	12.03	13.74	20.61
Bone meal	.30	.30	.30	.30	.30
Total	$15.82	$20.40	$15.99	$17.39	$27.04
Cost per day	.11	.15	.11	.12	.19
Cost per pound gain	.08	.10	.08	.08	.13
Summer: May 4, 1925, to October 11, 1925: 161 days					
Crushed oats and bran	$ 5.89	$ 5.89	$ 5.31	$ 4.87	$ 8.89
Sheaf oats	9.63	13.48	9.63	11.55	17.33
Bone meal	.36	.36	.36	.36	.36
Pasture	12.00	12.00	12.00	12.00	14.40
Total	$27.88	$31.73	$27.30	$28.78	$40.98
Cost per day	.17	.20	.17	.18	.25
Cost per pound gain	.11	.12	.11	.11	.16
Second Winter: October 12, 1925, to May 2, 1926: 203 days					
Crushed oats and bran	$ 8.72	$ 8.72	$ 7.85	$ 7.20	$13.15
Soybean hay and sheaf oats	18.98	26.57	19.92	22.78	34.16
Bone meal	.46	.46	.46	.46	.46
Total	$28.16	$35.75	$28.23	$30.44	$47.77
Cost per day	.14	.18	.14	.15	.23
Cost per pound gain	.14	.18	.14	.15	.24
Entire Period: 504 days					
Crushed oats and bran	$18.68	$18.68	$16.82	$15.42	$28.17
Soybean hay and sheaf oats	40.06	56.08	41.58	48.07	72.10
Bone meal	1.12	1.12	1.12	1.12	1.12
Pasture	12.00	12.00	12.00	12.00	14.40
Total	$71.86	$87.88	$71.52	$76.61	$115.79
Cost per day	.14	.17	.14	.15	.23
Cost per pound gain	.11	.13	.11	.12	.18

TABLE 7.—SUMMARY OF FIVE EXPERIMENTS IN FEEDING PUREBRED DRAFT FILLIES

(First experiment reported in full in Bul. 192; second and third in Bul. 235; fourth in Bul. 262)	FIRST	SECOND		THIRD		FOURTH	FIFTH
	Ear corn ½ Oats ½ Alfalfa hay Pasture	Lot I Corn 40% Oats 40% Bran 20% Alfalfa Oat straw Pasture	Lot II Corn 50% Oats 50% Alfalfa Oat straw Pasture	Lot I Cr. oats 75% Bran 25% Alfalfa Oat hay Pasture	Lot II Gr. corn 75% Bran 25% Alfalfa Oat hay Pasture	Cr. oats 75% Bran 25% Alfalfa Sheaf oats Pasture	Cr. oats 80% Bran 20% Soybean hay Sheaf oats Pasture
Length of trial, *days*	518	518	518	490	490	504	504
Number of animals	10	8	8	8	8	10	10
Aver. age at beginning, *days*	214	230	220	251	260	218	235
Height							
Aver. at beginning	13h—2.3″	13h—3.5″	13h—3.25″	14h— .53″	14h— .53″	14h— .4″	14h— .05″
Aver. at close	15h—2.3″	15h—3.21″	15h—3.19″	15h—2.88″	15h—3.38″	15h—3.65″	15h—3.40″
Aver. gain	7.96″	7.68″	7.91″	6.41″	6.84″	7.25″	7.35″
Weight	*lbs.*	*lbs.*	*lbs.*	*lbs.*	*lbs.*	*lbs.*	*lbs.*
Aver. at beginning	823	811	818	846	853	874	828
Aver. at close	1513	1544	1544	1482	1490	1439	1484
Aver. gain	690	733	726	636	637	565	655
Aver. daily gain	1.33	1.41	1.40	1.30	1.30	1.12	1.3
Grain							
Total eaten	5079	4404	4323	3115	2647	1490	1483
Aver. per day	9.81	8.50	8.35	6.36	5.40	2.96	2.94
Aver. per day per cwt	.811	.703	.695	.533	.445	.249	.25
Hay							
Total eaten	5168	5762	5357	3185	3225	3953	3042
Aver. per day	9.98	11.12	10.34	6.50	6.58	7.84	6.04
Aver. per day per cwt	.825	.919	.861	.545	.543	.659	.51
Other roughage							
Total eaten	.....	462	460	2491	2490	3607	4970
Aver. per day	.....	.89	.89	5.08	5.08	7.16	9.86
Aver. per day per cwt	.....	.074	.074	4.26	4.19	.602	.83
Feed per pound gain							
Grain	7.36	6.01	5.95	4.90	4.16	2.64	2.26
Alfalfa or soybean hay	7.49	7.87	7.38	5.01	5.06	7.00	4.64
Other roughage	.....	.631	.633	3.92	3.91	6.39	7.58